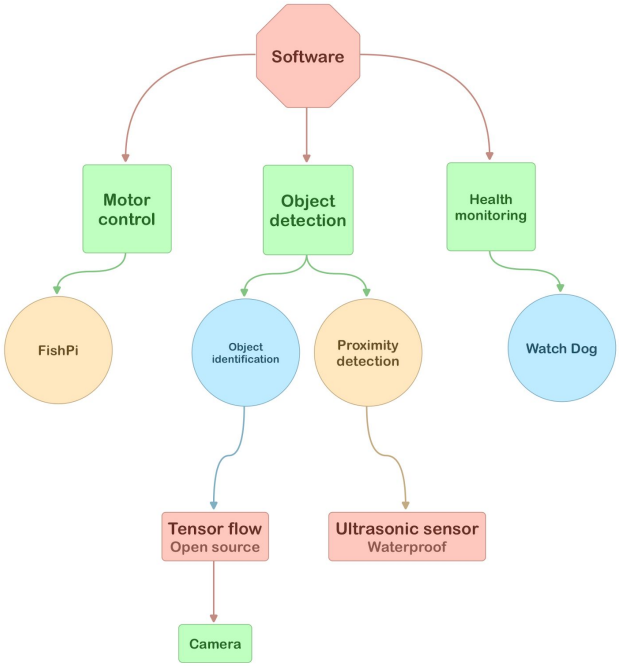
Abstract Idea for Software

Software is split up into 3 separate branches: Object Detection, Motor Control, and Health Monitoring.



Object Detection (Object Identification & Proximity Detection):

TensorFlow's Open Source Object Detection:

- For object detection, we used ImageAI's computer vision library, which allows us to detect objects (humans, cars, and bicycles).
- Main objective is to rescue the astronaut (human_Obj)
- Remaining objects will be "Unidentified", and considered a potential collision.

Waterproof JSN-SR04T Ultrasonic Distance Sensor:

- We chose an Ultrasonic Distance sensor to measure the distance from the vehicle to the object coming in our directed path. The only reason we chose the JSN-SR04T model sensor over the HC-SR04 ultrasonic sensor because it is waterproof. It has the same programming interface as the HC-SR04.
- Specification:
    - Measuring angle 45-75 degrees
    - Measuring range 25-450 cm
    - Operating voltage 5 V
    - Operating current 30 mA
- The sensor will work simultaneously with Tensor Flow, where Tensor Flow will confirm the incoming object in the directed path. Once the Ultrasonic sensor detects the ultrasound reflected

back waves, it will provide the distance as an input for the motor to steer the vehicle in the right direction to avoid the object.

- By timing how much time passed between sending and receiving the sound waves, we will calculate the distance between the sensor and an object ie:

$$\textbf{(cm)} = \textbf{Speed of sound (cm/µs)} \times \textbf{Time (µs)} / \textbf{2}$$

- Where Time is the time between sending and receiving the sound waves in microseconds.

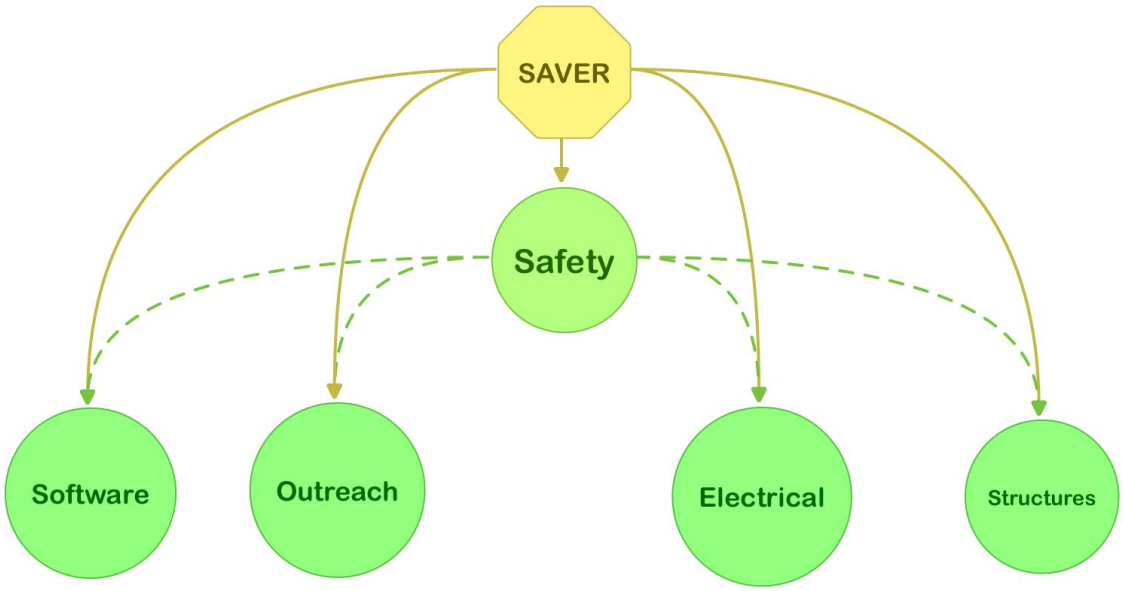
Camera:

- A small low power webcam 720p.

Motor Control:

Health Monitoring: To ensure compatibility between subsystems, each sensor-integrated unit requires calibration according to the recognized methodology. Listed below are the sensors implemented in the proposed SAVER design and their corresponding manner of calibration:

I. Battery
II. Motor: linearization of graph input:output = voltage:velocity, suggested use of MATLAB
III. Homing Beacon/Signal Receiver: ref. Electronics Update // 16 Oct. 2019, antenna receives VSWR: 2.0:1 Max at 121.5 MHz 1.5:1 Max. at 406 MHz, utilize notch filter within range of error for signal identification. Separate piece of code needed for outputting directional vector, *dependent entirely on receiver setup*. Clock accuracy of Rasp. Pi will determine precision of triangulation (detection of signal), as our two receivers will likely be a small distance apart. Pseudocode (keep in mind the writer here *sucks* at coding, just giving base ideas):
IV. Ultrasonic Transmitter
V. Camera [Visual Detection System]
VI. Accelerometer


SAVER
Safety
Software
Outreach
Electrical
Structures